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GAS ABSTRACTS

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1. GAS INDUSTRY

Annual Gas Report, 1954

$14 BILLION INDUSTRY HAS ITS BIGGEST YEAR. *Gas* 31, 42-45 (1955) January.

Twenty-eight million customers, consuming nearly 61 billion therms, brought revenues of $3 billion to the nation's gas utilities—all new records for the sixth largest industry in the United States. A complete report on the past year's statistics, containing graphs on gas sales, gas revenues, gas reserves, construction expenditures, gas range sales, gas customers, house heating customers, miles of gas pipelines, gas in underground storage, gas water heater sales, and gas central heating equipment sales.

Publishers' Abstract

Community Relations

GOOD NEIGHBOR POLICY SAVES ARKANSAS COMMUNITY IN TIME OF DISTRESS. *Gas* 30, 58 (1954) December.

When a severe drouth threatened the water supply of Nashville, Ark., a newly completed pipeline belonging to the Arkansas Louisiana Gas Co. was made available for filling the city's dangerously low reservoir.

Publishers' Abstract

Education

Dotterweich, Frank H. COURSES OF STUDY AT TEXAS A&I EXPAND WITH THE GAS INDUSTRY. *Gas* 30, 41-43 (1954) December.

The third part in a series on courses in gas engineering offered by colleges throughout the country describes the role that Texas A&I plays in this program. The author, who is Director of the Division of Engineering, discusses the degrees available, lists the faculty, and details the courses of study offered.

Publishers' Abstract

F.P.C. Regulation

Clark, William W. KUYKENDALL CITES "COMMISSION DISCRETION" AS RAY OF HOPE FOR GAS PRODUCERS. *Gas* 30, 46-48 (1954) December.

FPC's much disputed policies in connection with the famous "Rule 174-A" imposing commission regulation at the wellhead were recently discussed by its chairman at the API's 34th annual meeting, and the implications and interpretations of the speech are outlined by the author. Publishers' Abstract

Kuykendall, J. K. FEDERAL REGULATION OF NATURAL GAS. *Gas Age*, 114, 18, 19, 53, 54 (1954) December 2.

The commission realizes that the financial rewards of gas exploration and development must be commensurate with the risks, and rate making will give this factor consideration. The producing companies must be economically healthy —healthy enough to continue to produce the oil and gas America needs. The Phillips case established the fact that independent producers of natural gas who sell gas for resale in interstate commerce are "natural gas companies" and subject to FPC regulation, but the commission recognizes that the characteristics of the gas producing industry are quite different from those of the gas transmission companies, and will act accordingly. B. E. Eakin

Linz, B. F. FPC LEAVES GAS PRODUCERS IN DARK. *Oil Gas J.*, 53, 104-05 (1954) December 27.

The status of the natural gas producer selling gas at the wellhead is reported in the light of the new FPC order 174B modifying order 174A. The question of who is subject to regulation was deferred by the commission for determination by discussions in the cases involving Shell Oil Co., Deep South Oil Co., and Humble Oil and Refining Company. R. F. Bukacek

Ralph, H. D. FPC IS NEW LEGAL WILL-O'-THE WISP. *Oil Gas J.*, 53, 63, 64 (1955) January 24.

An analysis of the current status of the independent gas producers before the Federal Power Commission and the efforts by the producers to escape the present dilemma.

R. F. Bukacek

Northwestern Gas

Dougherty, T. PACIFIC NORTHWEST PIPE LINE KEY TO NEW FRONTIER. *World Petroleum*, 25, 46-50 (1954) December.

Approval by the Federal Power Commission of the application of Pacific Northwest Pipeline

for a permit to build a pipeline system for transport of natural gas from the San Juan Basin to the State of Washington is cited as opening up a new era of development in the Rocky Mountain region. The major areas considered to be substantial gas prospects which are to be crossed by the proposed pipeline are the Paradox Basin, Vinta and Piceance Basin and the Green River Basin in south western Wyoming and northern Colorado. These and other possible gas prospects are discussed in some detail.
R. F. Bukacek

PACIFIC NORTHWEST: START OF A NEW ERA. *Gas Age*, **115**, 26, 27, 52 (1955) January 27.

A review of the agreement between Pacific Northwest Pipeline Corp., West Coast Transmission, Ltd., and El Paso Natural Gas Co. on supplying Vancouver, B. C., Seattle, Tacoma, Spokane, and Walla Walla, Wash., and Portland, Ore., with natural gas from Peace River Field and San Juan Basin. H. R. Linden

Regulator's Qualifications

Smith, L. PROFESSIONAL QUALIFICATIONS OF FEDERAL REGULATORY COMMISSIONERS. PART II. *Public Utilities Fortn.*, **54**, 752-55 (1954) December 9.

In this installment the author discusses the political feeling or "sense of direction" of commissioners and the part this plays in the execution of their work. This sense of direction does much to determine the way in which decisions will be made within the legal limits of action, the acceptability of commissioners to the incumbent administration and whether the philosophy of the administration will be carried through into regulation. R. T. Ellington

Relocation Costs

UTILITIES FACE JOLTING RELOCATION COSTS IN FEDERAL HIGHWAY PROGRAM. *Am. Gas J.*, **181**, 16-17 (1954) December.

A problem currently facing the gas industry is the payment of the costs necessary to relocate utility facilities which become involved in the construction of Federal-aid highways. Since the existing law does not provide for payment out of Federal funds, added costs are passed on to the consumer. The consumer thus contributes twice to Federal-aid highways, once through his share of Federal taxes, from which funds for Federal-aid highways are derived, and second through increased rates for the utility service. The results of a study of the problem, provided for by Congress, will be reported to Congress in February, 1955. D. J. Dennison

2. APPLIANCES

Appliance Installation

Pacific Coast Gas Association. DATA BOOK ON GAS UTILIZATION. 69 pp. San Francisco (1954).

This reference provides a handy source of information on many of the problems most frequently encountered in sales and installation. Especially good sections are provided on commercial water heating and warm air space heating. R. E. Ellington

Appliance Sales

Arden, T. T. GAS APPLIANCE OUTLOOK. *Gas Age*, **115**, 43, 44, 93 (1955) January 13.

This should be a record-breaking year for home construction and home remodeling, and should therefore provide a huge market for the sale of appliances. The picture is further brightened by the aggressive attitude being shown toward the sale of appliances by many gas utilities. The increased sale of gas appliances is not limited to urban areas with natural gas systems, but also extends to rural areas using LP-gas.
E. F. Searight

Appliance Venting

Bennett, A. R. and Reichert, H. DISPOSAL OF PRODUCTS OF COMBUSTION FROM GAS APPLIANCES. *Gas J.* (British), 280, 743-45 (1954) December 15; *Gas Times* (British), 81, 393, 396-400, 405, 06, 08, 10 (1954) December 10; *Gas World* (British), 140, 1345-6, (1954) November 27; 1541-3 (Dec. 18); *Inst. Gas Eng.* (British), Publ. No. 458 (1954) November.

An evaluation and discussion is presented of the two normal methods for disposal of combustion gases from gas appliances. These methods

are direct venting into the room and the use of a flue. When flued appliances are used, flue restrictors are recommended to increase operating efficiency. Sulfur compounds in flue gases, because of their influence on condensation, have an adverse effect on room-vented appliance operation. Reduction of sulfur content of town gas is urged to allow a wider use of flueless appliances. The author recommends further study and developments of balanced flues and common flues, and the design of appliances for forced draught operation. E. J. Pyrcioch

The inefficiency of thermally operated vents is shown to be about 1/1000 of that of a relatively inefficient exhauster. A number of British practices are described in detail and pulsating combustion equipment is shown to permit vents of nearly the same size as the feed lines.

R. T. Ellington

Burners

Sassmanhausen, L. C. MIXING TUBE FOR GAS BURNERS. U. S. 2,694,445 (1954) November 16.

A simple, economical, and light-weight burner is claimed, constructed essentially of sheet metal, and particularly suitable for adaption to furnaces which are designed previously to consume a different type of fuel, such as coal or oil. Construction of burner is described and illustrated with four drawings. S. Hu

McNally, A. J. TURRET-TYPE GAS BURNER. U. S. 2,697,485 (1954) December 21.

Cookers

Rutenber, E. A. (assigned to Gibson Refrigerator Co.) COOKING RANGE. U. S. 2,698,373 (1954) December 28.

Controls and Ignition

Hartung, C. A. (assigned to Sun Oil Co.) FLAME FAILURE CONTROL. U. S. 2,696,876 (1954) December 14.

Hollman, P. I. (assigned to Geo. D. Roper Corp.) BURNER IGNITER AND SAFETY CONTROL. U. S. 2,696,877 (1954) December 14.

Koebbeman, R. F. and McCammant, L. H. (assigned to Geo. D. Roper Corp.) CHAIN IGNITION. U. S. 2,698,051 (1954) December 28.

Wingfield, I. S. AUTOMATIC GAS CUTOFF VALVE. U. S. 2,699,177 (1955) January 11.

Dryers

Spink, C. THESE GAS DRYERS SELL THEMSELVES. *Gas Age*, 114, 21-23 (1954) December 16.

Try it, buy it, sells gas dryers even in sunny Florida, by a nicely timed program which gives plenty of trying opportunity and the right amount of service follow-up.

Author's Abstract

Gas vs. Oil Heating

Bien, William GASMEN CHALLENGE HEATING CLAIMS OF OIL INDUSTRY. *Gas* 30, 52-54 (1954) December.

The advent of natural gas in Richmond, Va., started a feud between local gasmen and oil suppliers of the city. The latter claimed that the same amount of heat could be furnished by oil costing 23% less than the necessary gas. The gasmen countered by producing survey figures supporting the fact that gas was actually less expensive per Btu of heat produced than oil.

Publishers' Abstract

Space Heaters

Jensen, K. S. and Suhr, F. W. (assigned to Preway Inc.) FLOOR FURNACE. U. S. 2,697,429 (1954) December 21.

Norman, E. A., Jr., Reichelderfer, C. A., Herzig, H. L., and Raymer, H. G. (assigned to Norman Products Co.) FORCED-AIR, FORCED-DRAFT UNIT HEATER. U. S. 2,697,428 (1954) December 21.

3. COMBUSTION AND INDUSTRIAL FURNACES

Coal Burning Turbine

Yellott, J. I., Broadley, P. R., Meyer, W. M. and Rotzler, P. M. DEVELOPMENT OF PRESSURIZING, COMBUSTION, AND ASH SEPARATION EQUIPMENT FOR A DIRECT-FIRED, COAL-BURNING, GAS TURBINE LOCOMOTIVE. Am. Soc. Mech. Eng. Paper No. 54-A-201 (1954) November-December.

This paper describes the research programs which have been conducted for the Locomotive Development Committee since 1945 as part of the program in developing an open-cycle coal-burning gas turbine locomotive. The work of the various research organizations on the prin-

cipal problems of coal pressurization, combustion and ash separation is outlined. With available solutions to these problems, tests were made on two full-scale gas turbines, first with a Houdry process turbine and later with a 4250-hp Allis-Chalmers locomotive-type turbine, which resulted in an accumulation of 2600 hours of coal-fired gas-turbine service. Additional work which is necessary to bring the coal-fired gas turbine to a commercial status is summarized. Excellent illustrations are included of the component units at different stages of development. E. J. Pyrcioch

Combustion Products

Poirier, R. H. and Benington, F. THE CHEMISTRY OF HYDRAZYL FREE RADICALS. IV. CHROMATOGRAPHIC STUDIES WITH α, α-DIPHENYL-β-PICRYL HYDRAZYL AND SOME OF ITS -DERIVATIVES. *J. Org. Chem.*, 19, 1847-54 (1954) November.

In an effort to seek a free-radical reagent that can be used for the capture and identification of the active intermediates involved in combustion reactions, particularly of hydrogen atoms and hydrocarbon free radicals, the separation and identification of α, α-diphenyl-β-picrylhydrazil and its probable reaction products with hydrogen atoms, oxygen atoms, and hydroxy free radicals have been investigated by the chromatographic method. The hydrazyl-type of free radicals have been chosen for the study on account of their inertness to molecular oxygen, which is to be used as oxidant in later combustion studies. Paper describes the experimental technique and explains the chromatographic behavior of the hydrazyl radical and its derivatives by means of their ionic character. S. Hu

Flame Temperatures

Bundy, F. P. and Strong, H. M. MEASUREMENT OF TEMPERATURES IN FLAMES OF COMPLEX STRUCTURE BY RESONANCE LINE RADIATION. III. FROM ABSOLUTE INTENSITY MEASUREMENTS AT HIGH RESOLUTION. *J. Appl. Phys.*, 25, 1531-37 (1954) December.

A method for measuring flame temperatures is described which requires the determination of the intensity and emissivity of the flame at wavelengths within the intensity contour of a resonance spectral line such as D-line of sodium. An experiment is cited to illustrate the method in which a Fabry-Perot interferometer was used as the spectroscopic dispersion instrument. The emissivities were determined by comparing the brightnesses of the mirrored and unmirrored flame. The theory, procedure, and an example of using the method to find the temperature of a submerged zone of a flame are given. Authors' Abstract

Strong, H. M. and Bundy, F. P. MEASUREMENT OF TEMPERATURES IN FLAMES OF COMPLEX STRUCTURE BY RESONANCE LINE RADIATION. I. GENERAL THEORY AND APPLICATION TO SODIUM LINE REVERSAL METHODS. *J. Appl. Phys.*, 25, 1521-26 (1954) December.

Sodium line reversal temperature measurement by low resolving power spectroscopic instruments on complex flame structures gives temperatures intermediate between the highest and lowest temperature in the line of sight. This intermediate temperature is determined by the temperatures, optical depths and arrangement of the individual zones. By taking into account these factors, it is possible to derive temperatures for the inner zones of a complex flame. The theory, numerical data needed to apply the theory, and experimental examples are given. Authors' Abstract

Strong, H. M. and Bundy, F. P. MEASUREMENT OF TEMPERATURES IN FLAMES OF COMPLEX STRUCTURE BY RESONANCE LINE, RADIATION. II. SODIUM LINE REVERSAL BY HIGH-RESOLUTION SPECTROSCOPY. *J. Appl. Phys.*, 25, 1527-1530 (1954) December.

Sodium-line reversal temperature measurement by low resolving power spectroscopic instruments on complex flame structures gives temperatures intermediate between the highest and lowest temperature in the line of sight. An apparatus is described which was designed especially for determining the temperature structure in a complex flame by a modified sodium line reversal technique. Experimental data testing the validity of the method and a description of how it may be applied to complex flames is given. Authors' Abstract

Fuel Handling

Bookey, J. T. THE HANDLING AND STORAGE OF FUELS. *Fuel Efficiency* (British), 3, 114-16, 118, 120-21 (1954) November.

This is a discussion of coal handling, from ship, barge and truck both direct and to fuel bunker. Care of stock on the ground, fire precautions, methods of checking temperature rise in heaps, mechanization problems, unloading and overhead bunkers are some of the topics covered. Bunker oils are discussed under the headings—handling, conditions under which lagging of warm storage tank is advisable, transfer pumps, pipelines and preheaters. D. J. Dennison

Fuel Oxidation

Arthur, J. R. and Raftery, M. M. THE SLOW COMBUSTION OF SOLID FUELS. *Brit. Coal Utilis. Res. Assoc. Monthly Bull.*, 18, 469-76 (1954) October.

Recent literature on the slow oxidation by air or oxygen of carbonaceous solids at low temperature is reviewed. The important variables influencing the rate of oxidation appear to be, a) fuel volatile matter content, b) inorganic impurities, c) particle size and permeability, d) fraction of initial carbon present, e) temperature, and f) oxygen partial pressure. Each of these variables is discussed. Qualitatively, however the information is too limited to draw significant conclusions. C. G. von Fredersdorff

Gas Radiant Heat

Gough, R. H. AN ENCLOSED-FLAME RADIANT BURNER FOR GASEOUS FUELS. *J. Inst. Fuel* (British), 27, 603-4 (1954) December.

A gaseous-fuel burner has been developed in which the combustion zone and products stream is confined in the form of a thin disk by two plane surfaces, flow taking place radially outwards from the centre. The heat-transfer rate to the upper surface is thus increased by maintaining a high average velocity of the products, and also by the use of a ceramic radiating surface as the lower face. Some heat-transfer properties of the system are shown. The burner would appear to be suitable for operation by air-blast injection in certain industrial applications. Author's Abstract

Gas Infrared Heat

GAS-FIRED PANEL UNITS FOR INFRARED HEATING. *Can. Chem. Processing*, 38, 40, 42, 44 (1954) December.

The introduction of natural gas into Ontario and eventually to other parts of Eastern Canada has revived interest in the application of gas-fired, infrared heating units to industrial processes. The cheaper rates afforded by natural gas will encourage a re-examination of costs of infrared heating and their advantages for specific applications. The time required to heat up work depends on size, material and weight. Light-gage metal sheets can be heated up in a matter of seconds, heavy castings take about 30 minutes; the times for non-metallic materials such as plastics, etc., vary according to heat conductivity, bulk and shape, but in most cases the time for infrared heating is a fraction of that required by other processes. J. G. Chalcraft

Interchangeability

Hatton, W. D. EFFECT OF CHANGES IN GAS COMPOSITION ON COMBUSTION CHARACTERISTICS. PART I. *Nat. Gas Bull.* (Australia), 18, 6-12 (1954) July-August.

Palmer, W. J. EFFECT OF CHANGES IN GAS COMPOSITION ON COMBUSTION CHARACTERISTICS. PART II. *Nat. Gas Bull.* (Australia), 18, 9-12 (1954) September-October.

The Australian Gas Light Company will begin receiving a 1000 Btu/SCF, 0.725 specific gravity residual gas from a petrochemical plant in 1956. The heating value of this gas may be varied between 900 and 1500 Btu/SCF with six months notice. Since 512 Btu/SCF, 0.55 specific gravity gas is being used at present, a serious interchangeability problem may result. A project was, therefore, undertaken to determine the degree of interchangeability of various gases with the present coal gas. These tests were conducted on a group of bunsen type burners, a bray jet and pilot, and representative appliances. Results are correlated in terms of the Wobbe index and the Delbourg Combustion Potential. E. F. Searight

Ore Agglomeration

Davis, E. W. (assigned to Regents of the University of Minnesota) METHOD FOR HEATING SOLIDS. U. S. 2,696,432 (1954) December 7.

Strong compact agglomerates are produced by forming "green" compacts of iron ore mixed with 1% to 3% of fine carbonaceous fuel. These are passed by gravity flow down a shaft furnace through preheating, burning and cooling zones in sequence, and are contacted in the cooling zone with premixed air and hydrocarbon gas (about 3%). This gas rises and is preheated before entering the burning zone, where flameless combustion of the gas and the solid fuel raises the compacts to proper temperature (1100°-1200° C.) which is more closely controllable by adjustment of the gas feed.

O. P. Brysch

"Precision" Fuel

Hess, F. O. AUTOMATION AND THE GAS INDUSTRY. *Gas Age*, 114, 28-31, 57-60 (1954) December 2.

Gas has the required properties to provide heat for the automatic processes which are becoming more and more common in the heating field. Gas provides the possibility for a very fine degree of control so that with the growth of automation the prospects for gas are bright—provided this valuable feature is properly sold. In the past gas has often been sold on the basis of price alone. Since automatic plants must have reliable fuel supplies, interruptible gas will not do the job, and the factor of price must yield to the factor of quality in the sale of gas.

E. F. Searight

Treating Atmospheres

Koebel, N. K. PRACTICAL APPLICATION OF EQUILIBRIUM RELATIONSHIPS TO HEAT TREATING IN CONTROLLED ATMOSPHERES. *Ind. Heating* 21, 2408-10, 2412, 2414, 2416, 2418, 2577-78 (1954) December.

As applied to the heat treatment of steels, the author finds little practical application for theoretical equilibrium curves derived from the phase rule which relate the carbon content of the steels at a specified temperature with the partial pressure of certain of the furnace gases. Principle drawbacks are that a CO_2 analysis to within $\pm$ 0.05% is required and that true equilibrium conditions do not exist in the furnace. Empirical equilibrium curves relating furnace dew-point and steel carbon content at various temperatures are recommended for control use in place of the true equilibrium curves. Data for the former curves are obtained by direct measurement of dew-points and carbon contents of samples in industrial furnaces using an endothermic atmosphere. The dew-point equilibrium curves are useful for carburizing to specific carbon content of steel, homogeneous carburizing and neutral hardening. E. J. Pyrcioch

Turbine Deposits

Sulzer, P. T. THE INFLUENCE OF SOME CHEMICAL AND PHYSICAL FACTORS ON THE FORMATION OF DEPOSITS FROM RESIDUAL FUELS. Am. Soc. Mech. Eng., Paper No. 54-A-171 (1954) November-December.

The oil-ash deposit problem in industrial gas-turbine plants is analyzed from both physical and chemical standpoints. Theory and experiments on the formation of ash during combustion enable important processes in the buildup of deposits to be understood. These are demonstrated by means of practical examples. Measurements of ash-deposit formation as a function of temperature, pressure, excess air, fuel-ash content, and test duration, are shown graphically and summarized in a formula.

Author's Abstract

Steamed Gas Turbines

Miller, Benjamin WILL ADDED STEAM GIVE ECONOMICAL POWER BOOST TO GAS TURBINES? *Gas* 30, 93-96 (1954) December.

Lower cost per horsepower for equipment and lower fuel consumption per horsepower-hour generated can be obtained by adding steam to the air in the gas-turbine process. By means of diagrams and detailed explanations the author shows how this is possible, and details the advantages to the operator. Publishers' Abstract

4. CARBONIZATION AND GASIFICATION

Autogenic Coking

Baum, K. CONTINUOUS COKING PROCESS PROMISES LOW COST PRODUCTION. *Combustion*, 26, 61-5 (1954) November.

The Shawinigan traveling-grate carbonization process (U. S. Pat. 2,380,930) is discussed in comparison with externally-heated processes and an extensive theoretical analysis of this autogenic coking method is given. Based upon the heat content of the volatile matter of the coal, air-dried fuels with 15 to 45% volatile can be successfully treated (can produce sufficient heat to attain 2200° F.) and an inert (O_2-free) atmosphere can be maintained. The coke thus produced, a granular char, can be made from a wide range of fuels, and sintering of a coal-ore mixture also is possible. Coking at a rate of 37 to 61 lbs per sq.ft per hour, as compared to the oven-coking rate of 2.1 to 2.5 lbs, the coking time is reduced to one-thirtieth, and plant construction and operating costs are greatly reduced. Basic fuel graphs and layouts are given.

O. P. Brysch

Carbonizing Apparatus

Poindexter, F. E. and Lowe, F. W. ROTATABLE CARBONIZING MACHINE. U. S. 2,697,068 (1954) December 14.

This patent refers to the designing of a machine for carbonization of coal which will permit better utilisation of the heat generated and reduction of carbonizing time. Improved mechanism is provided for stirring, for recovering the heat produced for distillation purposes, for preventing the collection of distillation products and for recovering steam produced in the cooling of char and using it to heat the retort.

K. C. Channabasappa

Coal Dust Control

AUTOMATION FOR DUST-FREE COAL PROCESSING. *Heating and Ventilating*, 51, 89-91 (1954) December.

A generalized description is presented of a plant which processes lump coal and coal tar pitch into fine pulverized foundry mold facing materials. Features of the plant include an automatic materials handling and processing equipment installation, an all-inclusive dust control and collection system and explosion-proof motors and electrical equipment, all arranged with an economy of space.

E. J. Pyrcioch

Gas Cooling

Silver, L. CARBURETTED WATER GAS COOLING AND CONDENSING. Gas Council Res. Comm. G. C-15. *Gas J.* (British), 280, 740-742 (1954) December 15; *Gas World* (British), 140, 1347 (Nov. 27).

This article reveals the knowledge gained by the Research Department of the North Thames Gas Board in the study of processes involved in the cooling and condensing of manufactured gas. (See *Gas Abs.* 11, 33).

S. Volchko

ONIA-GEGI Oil Gas

Diamond, G. B. THE WEST MIDLANDS APPROACH TO THE GASIFICATION OF RESIDUAL OIL. Inst. Gas Engrs. (British) Commun. No. 456, 39 pp. (1954) November; *Gas World* (British), 140, 1347-49 (1954) November 27; 140, 1414-17 (1954) December 4 (Discussion); *Gas World*, 141, 83-84 (1955) January 1; *Coke and Gas* (British), 16, 485-90 (1954) December; *Fuel Efficiency* (British), 3, 178-80 (1954) December; *Gas J.* (British), 280, 531-34, November 24; 671, 2 (1954) December 8; *Gas Times* (British) 81, 328, 31, 2, 6, 7, 8, 40, 42 (1954) November 26.

For 1 year (May 1953 to May 1954) the West Midlands Board has conducted experimental work on thermal gasification of heavy fuel oil at Saltley Works, (Birmingham) in a modified 2.75 MMCF/D water gas set of H-G design, injecting into both generator and carburetor. Since September 30, 1952, an ONIA-GEGI regenerative catalytic oil gas plant has been in operation at Solihull, West Midlands. An earlier Solihull experiment (1951) was a modified 500 MCF/D machine, using the old carburetor and superheater as regenerators for air and steam preheating respectively, with addition of an oil-heated catalyst (nickel) chamber. Problems of oil distribution, temperature distribution, cycle time, heating oil, heat recovery, catalyst depth, and oil quality and conversion were studied and the results of test operations are tabulated. A yield of 1.33 therms of 410 Btu gas was obtained per gal. of 1000-sec. heavy fuel oil. Finally in May 1954, a new non-regen-

erative plant of the ONIA-GEGI catalytic type went into operation of Stafford. Oil is used for air preheating and steam is raised from the waste heat in catalyst blow-gases. Similar gas yield efficiencies have been attained and operating costs are appreciably lower than those of carburetted water gas. However scarcity of cheap fuel oil now permits no reduction in costs.

O. P. Brysch

Reformed Gas

Riesz, C. H. and Lurie, P. C. (assigned to The Institute of Gas Technology) METHOD OF PREPARING A GAS INTERCHANGEABLE WITH COKE OVEN GAS, CARBURETED GAS, OR MIXTURES THEREOF. U. S. 2,692,193 (1954) October 19.

A method is claimed for the catalytic reforming of liquid hydrocarbon containing aromatic and olefinic material without the deposition of carbon on the catalyst. This is prevented by the thermal selective cracking of the hydrocarbon in the presence of steam. H. A. Dirksen

Dickinson, N. L., Hill, L. R., and Williams, T. S. (assigned to The M. W. Kellogg Co.) MANUFACTURE OF A HYDROGEN-RICH GAS. U. S. 2,697,655 (1954) December 21.

The patent refers to a conventional method of manufacturing synthesis gas through partial combustion of hydrocarbons with oxygen followed by steam reforming of the hot combustion products in a fluid catalytic reactor.

C. G. von Fredersdorff

"Segas" Oil Gas

Stanier, H. and McKean, J. B. THE PRODUCTION OF TOWN GAS BY THE CATALYTIC GASIFICATION OF PETROLEUM OIL. II.—DEVELOPMENT AND OPERATION OF A COMMERCIAL PLANT. Instn. Gas Engrs. (British) Commun. No. 457, 31 pp. (1954) November; *Gas World* (British), 140, 1344-5 (1954) November 27; 1414-17 (1954) December 4; *Coke and Gas* (British), 16, 485-90 (1954) December: *Gas J.* (British) 280, 673, 4 (1954) December 8; *Gas Times* (British) 81, 382, 4, 89-92 (1954) December 10.

Centering around the development of a new highly refractory lime-magnesite catalyst, the "Segas" oil gasification plant at Sydenham, built by the Power Gas Corp., has operated for 18 months on a wide range of petroleum oils. This 800 MCF/D plant has attained efficiencies of 1.23 to 1.37 therms of 450 to 550 Btu gas per gal. oil (gross), on feeds of 950-sec. heavy fuel oil. The catalyst, resistant to 1500° C., in a central chamber, receives the oil spray with a flow of superheated steam from a preheater for 2 minutes, then during a "blow" run, the deposited carbon is burned out of the catalyst by preheated air for 2½ minutes. Tests of different grades of oil, and temperatures of catalyst are reported, together with gas and tar yields, heat-balances, cost estimates, and possible modifications of the process. O. P. Brysch

Synthesis Gas

Hardwick, J. M. TOWN GAS FROM BROWN COAL. *Gas Times* (British), 81, 492-94 (1954) December 24.

A plant is being erected near Melbourne, Australia for complete gasification of brown coal using the Lurgi High Pressure Gasification Process. Scheduled for operation in 1956, the plant will produce 20 MMCF of distributable gas daily. Gasification will proceed at a pressure of 30 atmospheres in six generators in a medium of oxygen and superheated steam following initial carbonization of the coal. Tar and oil byproducts will be recovered from the gas. Carbon dioxide will be removed by high pressure water scrubbing. Oxygen will be supplied by two 100-ton/day liquefaction plants. Produced at high pressure, the gas after cleaning will be passed directly into a transmission line without further compression.

E. J. Pyrcioch

Peery, L. C., McKane, R. H., and Moses, D. V. (assigned to E. I. du Pont de Nemours and Co.) PREPARATION OF SYNTHESIS GASES FROM CARBONACEOUS SOLIDS. U. S. 2,698,227 (1954) December 28.

Synthesis gases are produced from solid carbonaceous materials by gasification of the pulverized solids in steam and oxygen at atmospheric pressure. This operation is conducted in a vertical downflow slagging generator which has provision for the continuous removal of fused ash via a quench tank and under-water conveyor. C. G. von Fredersdorff

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black Sources

Strasser, D. M. FROM HYDROCARBONS TO CARBON BLACK. *Petroleum Refiner*, 33, 177-182 (1954) December.

Due to rising cost of natural gas as a raw material for the manufacture of carbon blacks, the recent trend is to the use of oil. The carbon blacks are described and classified according to the process of manufacture. S. Mori

Coal Mine Methane

Minchin, L. T. METHANE FROM COAL MINES—THE PRESENT POSITION. *Coke and Gas*, 16, 357-62 (1954) September.

UTILIZATION OF METHANE FROM COAL MINES—THE PRESENT POSITION. *Coke* cember; 17, 33-35 (1955) January.

Developments in the past 2 years are reviewed in the field of methane extraction from coal strata. Boreholes into "relaxed" roof-rock, rather than the coal seam, have been most successful. Variation in borehole practices and yields are discussed, as well as safety devices and questions of reliability of supply. The second article reviews the output of methane, with the total estimated yield of 280,000 therms per day for Britain, Germany, Belgium, Saar and France where 2, 20, over 27, 18 and at least 4 mines, respectively, are drained. In Germany at least 9 mines are using methane as boiler fuel, about one-half of the production. More efficient utilization occurs in Belgium, where 2 grids distribute the methane for steel-works, coke-oven and boiler fuel, reformed gas for domestic grids, and fuel for pipe-line compressors. Similar applications are made in Saar and France. Both British mines (in N. Wales and Cumberland) use methane for boiler fuel but are increasing its use as reformed gas in industry. This is a trend which may start at the individual coal mine, but for it to be of real value it must be assisted by a central organisation which can link up the adjacent mines by a collecting system, and can arrange for the gas to be utilised in the most efficient way.

H. A. Dirksen

Compression

Scheel, L. F. DEVELOPMENT OF THE MODERN GAS ENGINE COMPRESSOR PLANT. *Petroleum Eng.*, 26, D45, 46, 48, 50, 51 (1954) December.

An analysis of developments in gas engine compressor plants since 1931 with emphasis on the refinements made and their impact on costs.

R. F. Bukacek

Conversion Bibliography

GAS SELECTED BIBLIOGRAPHY. 3, Conversion to Natural Gas. Gas 30, 55-56 (1954 December).

Third in a series of selected listings of articles that have appeared in GAS over the past 30 years. Subject: Conversion to Natural Gas.

Publishers' Abstract

Cost of Records

Ringelstein, Herbert W. HIDDEN COSTS ELIMINATED IN MASS RECORD KEEPING SYSTEM. Gas 30, 39-40 (1954) December.

During the process of expanding its filing facilities for credit history records, Rochester Gas & Electric Corp. exposed and eliminated many hidden cost factors. Motorized vertical filing units were installed, requiring less floor space than the out-dated slide-visible files, and greatly increasing the efficiency of the operators.

Publishers' Abstract

Dust Removal

Old, A. F. (assigned to Southern Lightweight Aggregate Corp.) AIR AND GAS TREATMENT SYSTEM. U. S. 2,696,274 (1954) December 7.

An elongated chamber of wood construction with internal baffles and a system of water sprays is used for the removal of fine particles from gaseous mixtures. This system is particularly adapted to the treatment of high-temperature gases discharged from stacks at ends of kilns. E. J. Pyrcioch

Pring, R. T. (assigned to American Whelabrator and Equipment Corp.) WET CYCLONE SCRUBBER. U.S. 2,696,275 (1954) December 7.

Particularly adaptable to multiple cyclone units of small diameter, this patent claims an appa-

ratus for the operation of a water-sprayed small-size cyclone dust separator which will not plug with wetted dust particles.

E. J. Pyrcioch

Fire Protection

Heller, F. J. FIRE PROTECTION IN UTILITY LP-GAS INSTALLATIONS. *Gas Age*, 114, 24-28 (1954) December 16.

The author discusses the safety features, design changes, pertinent national fire code changes, and general safety recommendations aimed at giving maximum safety in LP-Gas installations.

S. Volchko

AIR-PLACED VERMICULITE CONCRETE FIREPROOFS STANDBY EQUIPMENT. *Gas* 30, 44-45 (1954) December.

A new method of fireproofing LPG tanks adopted by Minneapolis Gas Co. is described. Simple and speedy application, lower cost, and great durability are stressed as advantages of this process. Publishers' Abstract

Gas Condensates

Beecherl, L. A., Jr. CONDENSATE EXTRACTION FROM LEAN GAS. *Oil Gas J.*, 53, 91-92 (1954) December 20.

A 25-ton Servel water chiller is used lower the temperature of a lean gas stream to near the hydrate point with resultant condensation of 85% of the pentane plus content. The amount of gas is too small to permit economic treatment by any other way, but this process doubles the recovery and will pay out in nine months.

R. T. Ellington

Dean, R. R. SIMPLICITY, FLEXIBILITY, ECONOMICAL OPERATION. *Oil Gas J.*, 53, 77-79 (1954) November 29.

The Tennessee Production Co. has placed in operation its new R.R. Dean, 70,000 gal. per day hydrocarbon recovery plant for processing 100 MMCF of lean gas from wells located in several counties in Southwest Texas. The stripped gas enters the Tennessee Gas Transmission Co. pipeline system. Design features include a rich-oil demethanizer, simplified and flexible operation, lean-oil dehydration unit using steam for stripping that eliminate further dehydration of the absorber residue gas, and extensive instrumentation to permit maximum operating efficiency and safety with a minimum of personnel. A flow diagram of the plant and analysis of entering gas, is included.

B. E. Eakin

Foster, A. L. TAMING "WILD" GASOLINE. *Petroleum Eng.*, 26, C49-54, 56 (1954) October.

The author outlines the history and development of the natural gasoline and LP-Gas industry. Future uses of these products will include large amounts in petrochemical manufacture and increasing use in motor fuels.

W. G. Bair

Gas Purchase

Walker, T. P. BUYING GAS FOR PIPE LINES. *Gas Age*, 114, 38-39, 67-70, (1954) December 16.

The history of purchasing gas from producers on the Gulf coast is given from the time prices were of the order of ½ to 1 cent per MCF thirty years ago to the present time when Transco is paying 16 to 20 cents in Louisiana. The factors which have contributed to price escalation are mentioned, including automatic increase clauses in contracts derived to pay the producer the interest on the values he was holding for future realization. The present clouded situation arising from FPC Order No. 174 is also discussed. R. T. Ellington

Gas by the Pound

Bean, Howard S. A POUND OF GAS? *Gas* 30, 31-32 (1954) December.

The author discusses the possibility of adopting the pound as the unit of measure in wholesale metering of natural gas. Because such a system of measurement would greatly simplify current methods, steps are being taken to develop the necessary instruments. Publishers' Abstract

Locating Hydrocarbons

Horvitz, L. NEAR-SURFACE HYDROCARBONS AND PETROLEUM ACCUMULATION AT DEPTH. *Mining Eng.*, 6, 1205-09 (1954) December.

Microanalysis of near-surface soils for hydrocarbons is the basis of a method for locating gas and oil deposits. To substantiate this technique, evidence of vertical migration of hydrocarbons from petroleum accumulations is presented. Tabulated data relevant to hydrocarbon surveys conducted in several petroleum provinces are included. Author's Abstract

L-P Gas Industry

Benz, G. R., Tucker, P. W. and De Voe, W. F. L.P.G. RECORDS FALL AGAIN IN '54. *Oil Gas J.*, 53, 58-60 (1955) January 3; *Amer. Gas Assoc. Monthly*, 37, 11-12 (1955) January; *Gas Age*, 115, 48-52 (1955) January 13; *Natn. Petroleum News*, 47 67, 70, 71 (1955) February; *Gas Heat*, 6, 29, 65 (1955) February; *Butane-Propane News*, 17, 31-4 (1955) January; *Petrol. Eng.* 27, C27-30, C32 (1955) January.

LP-gas sales increased 4.1% over 1953 figures based on estimates prepared by Phillips Petroleum Company. Domestic sales are being counted on for the continued growth of the LP-gas industry. No supply shortage is foreseen. W. G. Bair

Pipe Line Corrosion

Paredes, F. and Mize, W. W. GAS LINE HYDROGEN BLISTERS AND HOW TO PREVENT THEM. Pipe Line Industry, 1, 74-78 (1954) December; *Gas*, 30, 89-92 (1954) December.

Severe breaks in a natural gas transmission line from the Barker Dome field (Colorado-New Mexico) to a natural gas treating plant in Fruitland, N. M., have been traced to hydrogen blisters inside the pipe. These appear to be caused by the segregation at metal discontinuities of molecular hydrogen from the atomic hydrogen formed during corrosion of the low-carbon steels by aqueous H_2S and CO_2, as has been experienced in oil refinery corrosion. Experience on this line including methods of detecting H_2 in the pipe metal, conditions leading to attack, and use of organic corrosion inhibitor to prevent attack are discussed. D. M. Mason

Pipe Line Design

Poor, W. B. WHAT FACTORS AFFECT PIPE LINE DESIGN? *Gas Age* 114, 29, 30 (1954) November 18.

The economic factors affecting engineering design are cited: character of market and development of load factor; avoidability and economics of storage; determination of line size vs. ultimate installed horsepower; and predetermination of pipeline location. These factors are discussed with in brief and illustrated with tables typical figures. R. F. Bukacek

Radiography of Lines

Horland, H. RADIOGRAPHIC INSPECTION OF PETROLEUM PIPE LINES. *Pipe Line News*, 26, 39-43 (1954) December.

By means of radiographic inspection of the pipelines, the welding procedures may be controlled. Furthermore, by such a method, unsound welds may be eliminated and a substantial saving in cost may be realized. Improved techniques have cut the cost from .023 cents per foot in 1948 to .0189 cents per foot at present. S. Mori

Regulator Station Noise

Serafino, C. A. EXPERIMENTS IN SOUND ABATEMENT. Gas 30, 49-50 (1954) December.

A whistlelike noise is created at pressure-reducing stations when high gas pressures are cut to low, thereby increasing the velocity. This noise can be very annoying to people working in the vicinity. The author describes in this article how sound was reduced at five United Gas Stations in Texas.

Publishers' Abstract

River Crossing

DELAWARE RIVER CROSSING LAID THRU SOLID ROCK ON TEXAS EASTERN LINE. *Pipe Line News*, 26, 36-39 (1954) November.

The twin river crossing, using a 24-inch main line and 16-inch auxiliary, was completed in three months. All bends in the crossing, 1000 feet long under water and 1800 feet from header to header, were pre-bent and the line pulled with bends made. The river-bed was rock throughout, with shale and limestone encountered. The lines had to pass under the Pennsylvania-Delaware Canal, the Raritan Canal and the Pennsylvania Railroad.

B. E. Eakin

Soil & Line Temperatures

Murray, T. B. and Whalley, W. C. TEMPERATURES AND THERMAL CONDUCTIVITY OF THE GROUND ALONG THE ALIGNMENT OF THE 30-INCH PIPELINE KIRKUK-BANIAS IN RELATION TO OIL TEMPERATURES. *J. Inst. Petroleum* (British), 40, 372-400 (1954) December.

Soil temperatures and thermal conductivities were determined at fifty sites along the 556-

mile route of the 30-inch pipeline from Kirkuk, N. Iraq, to Banias, Syria. This information was required for oil temperature prediction. Thermal conductivities were derived from the decrement and lag of the annual temperature waves at 2, 4½, and 6½ feet, obtained by frequent observation of thermometers in closed asbestos tubes. The necessary soil densities and specific heats were found by laboratory measurements on samples. In the method of mixtures for specific heats aluminium pellets were used as a standard, and inclined rotating calorimeters to obtain effective mixing of the two components. Some oil temperature predictions are compared with the corresponding observed values. Recorded results include: a) thermal conductivities, specific heats, densities, and monthly average soil temperatures by locations and depths; b) reproductions of temperature waves by locations and depths.

Authors' Abstract

Transmission Standards

Cramer, A. H. HIGHLIGHTS OF THE NEW PIPING CODE. *Gas Age*, 114, 20-22, 41, 43 (1954) December 30.

A new piping code for gas transmission has been prepared by a committee of the ASA. The code is now in publication and will be accepted as the new standard. The objective of the code was to establish maximum safety without adverse economic effect. Preliminary reports on the code indicate that it has accomplished this objective. W. G. Bair

Hough, Fred A. THE NEW GAS DISTRIBUTION AND TRANSMISSION PIPING CODE Gas 31, 58-59 (1955) January.

First in a series of articles describing the new American Standards Association Code for Gas Transmission and Distribution Piping. Attention is called to the code itself and to specific items in the code. The author relates background material concerning the thinking of the committee, and some of the facts that led the committee to its conclusions.

Publishers' Abstract

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Coal to Oil Synthesis

SASOL PLANT OPERATING. *Oil Gas J.*, 53, 103 (1954) December 13.

The 92 million dollar coal to oil synthesis plant near Johannesburg, So. Africa has gone into preliminary operations with scheduled full production of 5,500 B/D of liquid hydrocarbons near the end of 1955. The plant is justified economically because of a nearly coal supply of sufficient quantity to last 140 years at at current production rates. Coal mining costs have been reduced to approximately 70 cents/ton. The synthesis plant comprises a coal gasification section which produces carbon monoxide and hydrogen and an improved catalytic section, based on the Fischer-Tropsch process, which produces liquid hydrocarbons and chemicals.

C. G. von Fredersdorff

Desulfurization

Zahnstecher, L. W. and Petrarca, C. A. ACHIEVING CATALYTIC DESULFURIZATION OF PETROLEUM DISTILLATES. *Oil Gas J.*, 53, 78-81 (1954) December 20.

Current techniques for desulfurizing petroleum distillates are summarized. D. M. Mason

Fluid Coking Tests

Johnson, F. B. and Wood, R. E. NEW DATA ON FLUID COKING. *Petroleum Refiner*, 33, 157-60 (1954) November; *Oil Gas J.*, 53, 60-62 (1954) November 29.

Ten residuum stocks have been tested and comparisons have been made with commercial plant delayed coking results. Temperatures in the fluidized coking reactor are in the range of 900-1050° F. and pressure is essentially atmospheric. The weight percent of coke formed was found to be directly proportional to the Conradson carbon of the feed. The fluid process produces much less coke, much more gas oil, less naphtha, and somewhat less gas than the delayed coking process. E. B. Shultz

Hydropyrolysis of Shale

Smith, L. B., Mason, R. B., Blanding, F. H., and Hemminger, C. E. (assigned to Standard Oil

Development Co.) DISTILLATION OF OIL-BEARING MINERALS IN TWO STAGES IN THE PRESENCE OF HYDROGEN. U. S. 2,694,035 (1954) November 9.

A two-step process for production of oil from subdivided shale is proposed. First, the shale would be soaked in hydrogen (6000-10,000 SCF hydrogen per ton of shale) at 650-750° F. for 5 to 15 hours. This would be followed by retorting in presence of hydrogen at 800-950° F. for one to five hours. Soaking and retorting would be carried out at about 1000 psig. The addition of inorganic polar compounds in small quantities (water, sodium hydroxide, calcium chloride) may enhance product yields and quality. By this process, it is claimed that substantial reductions in the sulfur and nitrogen content of the product oil are achieved. E. B. Shultz

7. ANALYTICAL METHODS AND TESTS

Ammonia Liquor Analysis

Blackburn, W. H., Barker, L. and Catchpole, J. R. AN INVESTIGATION INTO THE COMPOSITION OF AMMONIACAL LIQUOR. I.—CONTINUOUS VERTICAL RETORT LIQUOR. Gas Council (British) Research Commun. GC17, (1954) November; *Gas World*, (British) 140, 1349 (1954) Nov. 27; *Gas Times* (British) 81, 345-6 (1954) Nov. 26.

Previous analytical studies of ammoniacal liquor are reviewed. The present study was made on Leeds gasworks liquors (4300 liters) from continuous vertical retorts carbonizing Yorkshire gas coals. Organic constituents were separated by a quadruplicate extraction with methyl iso-butyl ketone (under CO_2 atmosphere) then distillation at 150 mm Hg. The concentrated extract was separated chemically, first by an Na_2CO_3 washing, which extracted "carboxylic" and "humic" acids (0.66%), then by an NaOH washing which extracted phenols (5.7%) and left behind the neutral and basic oils (0.17%). The phenols were fractionated into monohydric (3.7%) and polyhydric (2.0%) groups, the latter boiling above 96° C. The remainder of the work discusses the fractionation (at 50 mm Hg) and identification of compounds in the fractions of the monohydric phenol group by infrared spectroscopy. Sixteen monohydric phenols were identified and amounts were estimated. Phenol, and meta-, para-, and ortho-cresols comprised 52.4%, 15.0%, 12.6% and 9.35% respectively of these monohydric phenols. The analysis of the polyhydric fraction will be reported later. O. P. Brysch

Aromatics by Infrared

Martin, J. M., Jr., Johnston, R. W., and O'Neal, M. J., Jr. QUANTITATIVE ANALYSIS OF AROMATIC HYDROCARBONS IN THE 2- to 25-MICRON INFRARED REGION. *Anal. Chem.*, 32, 1112-1115 (1954) December.

A method is described for the analysis of individual aromatic hydrocarbons through C_9's. A combination of distillation and infrared spectrometer methods is utilized. D. V. Kniebes

Ethylene Method

Shepp, A. and Kutchke, K. O. AN ACCURATE METHOD OF ANALYSIS FOR SMALL QUANTITIES OF ETHYLENE. *Can. J. Chem.*, 32, 1112-1115 December.

A procedure is described for the accurate analysis of ethylene in mixtures of ethane and ethylene by hydrogenation over a nickel-kieslguhr catalyst. Samples of ethylene as small as 0.03 cc. in mixtures of the order of 1.5 cc. of gas at N.T.P. can be determined to an accuracy of about one-half per cent. Results are reported over a range of mixtures.

Authors' Abstract

Gas Technique

Carpenter, P. G. (assigned to Phillips Petroleum Co.) SYSTEM FOR GAS ANALYSIS. U. S. 2,694,923 (1954) November 23.

This invention provides a method of analyzing drilling mud to detect the presence of hydrocarbons, and, when hydrocarbons are present, to obtain a quantitative analysis of the hydrocarbon content and particularly to determine whether the drill-bit is traversing a gas-bearing formation or a formation permeated by normally liquid hydrocarbons. For this purpose gases released from the mud are passed continuously through an analyzer, such as an infrared analyzer or a differential refractometer; when presence of hydrocarbon is indicated, flow of the gas is automatically shifted to pass through a sorption unit containing a material such as silica gel before passing through the

analyzer. As a hydrocarbon mixture of constant composition is passed through the sorption unit, the effluent will first contain the inert gases present in the stream, then the hydrocarbons of lowest molecular weight, and finally, hydrocarbons of progressively increasing molecular weight. D. M. Mason

Ingram, G. SOME APPLICATIONS OF THE VAN SLYKE MANOMETRIC TECHNIQUE. *Chem. and Ind.* (British), No. 50, 1527-31 (1954) December 11.

Van Slyke's gasometric methods, which are used extensively by the biochemist, have applications in other branches of chemical analysis, for example, the determination of amino nitrogen and carbon in organic compounds, carbon monoxide in air and carbonate in aqueous solutions. The methods discussed are essentially microchemical. The Van Slyke apparatus details are described. D. J. Dennison

Gas Oil Analysis

Lumpkin, H. E. and Johnson, B. H. IDENTIFICATION OF COMPOUND TYPES IN A HEAVY PETROLEUM GAS OIL. *Anal. Chem.*, 26, 1719-1722 (1954) November.

Analytical methods for petroleum products have been extended from gas through gasoline, kerosine, and heating oil in recent years. One of the last major challenges in composition studies of petroleum lies in the gas oil and lubricating oil ranges. A combination of separation techniques, and ultraviolet and mass spectrometric data on the separated materials has been applied to the identification of hydrocarbon and sulfur compound types in the aromatic portion of a heavy gas oil. The majority of the sulfur compounds in the sample of fairly high sulfur content investigated is shown to be of the condensed aromatic-thiophene type. Figures are given showing the compound type identifications and the order of removal of the types from alumina gel. Authors' Abstract

Lube Oil Analysis

Melpolder, F. W., Brown, R. A., Washall, T. A., Doherty, W. and Young, W. S. ANALYSIS OF LUBRICATING OIL BY THERMAL DIFFUSION AND MASS SPECTROMETRY. *Anal. Chem.*, 26, 1904-1908 (1954) December.

An analytical study was made to determine the effectiveness of the thermal diffusion process for the separation of a light lubricating oil into specific hydrocarbon types. Sixteen different hydrocarbon types were identified and determined in the thermal diffusion fractions by mass and ultraviolet spectrometry. The thermal diffusion process was shown to concentrate cycloparaffins according to number of rings, isoparaffins, and n-paraffins. A lower degree of separation was obtained for the aromatic hydrocarbons. Authors' Abstract

Nitrogen Dioxide Method

Saltzman, B. E. COLORIMETRIC MICRODETERMINATION OF NITROGEN DIOXIDE IN THE ATMOSPHERE. *Anal. Chem.*, 26, 1949-55 (1954) December.

A new specific reagent, which is a mixture of sulfanilic acid, N-(1-naphthyl)-ethylene-diamine dihydrochloride, and acetic acid has been demonstrated to absorb efficiently at levels below 1 ppm. A stable direct color is produced with a sensitivity of a few parts per billion for a 10-minute sample at 0.4 liter per minute. Ozone and other gases interfere only slightly. D. J. Dennison

Petroleum Nitrogen

A.P.I. Research Project 52 (Progress Report: NITROGEN COMPOUNDS IN PETROLEUM. *Oil Gas J.*, 53, 348-350, 353, 354, 357 (1954) November 15.

This project reports on the study of the separation of nitrogen-bearing groups from crude oil, the isolation of the individual compounds from the separated fractions, and the preparation of highly purified nitrogen compounds for use as calibration standards for the determination of physical and spectral properties and for use in the measurement of thermodynamic properties. The information developed would be useful in the solution of such problems as catalyst poisoning, product instability and fuel deposits, as well as the origin of petroleum. D. J. Dennison

Petroleum Sulfur

McCoy, R. N. and Weiss, F. T. APPLICATION OF CATALYTIC DESULFURIZATION TO GROUP SULFUR ANALYSIS OF PETROLEUM FRACTIONS. *Anal. Chem.*, 26, 1928-33 (1954) December.

Previous methods for the group sulfur analysis

of petroleum oils have been fully applicable only to low-boiling distillates, such as gasoline, since the mercury salt techniques employed for differentiating nonthiophenic from thiophenic sulfur are limited to sulfur compounds in the lower molecular weight range. This limitation has been overcome, to a considerable extent, by employing selective catalytic decomposition to differentiate nonthiophenic from thiophenic sulfur. The nonthiophenic sulfur compounds are decomposed over alumina at 450° C. to hydrogen sulfide and, presumably, the corresponding olefin, while the thiophenic sulfur compounds are stable under these conditions. Titration of the hydrogen sulfide, which is generally recovered to the extent of 90 to 95% from pure nonthiophenic sulfur compounds, provides a rapid and reasonably quantitative means of determining the content of nonthiophenic sulfur. Thiophenic sulfur is calculated as the difference between the total sulfur content of the sample and the value obtained for nonthiophenic sulfur. This distinction, in connection with conventional methods for determination of elemental sulfur, hydrogen sulfide, mercaptans, and disulfides, enables group sulfur analyses to be made on heavier petroleum fractions than was previously possible. The method has been applied to a wide variety of petroleum fractions, including light and heavy distillates, lubricating oils, crude oils, residues, and shale oils.

Authors' Abstract

Kreider, R. E. and Foulds, J. G. BOMB-VOLUMETRIC METHOD FOR SULFUR IN REFINED PETROLEUM PRODUCTS. *Anal. Chem.*, 26, 1983-85 (1954) December.

The method is based on the hydriodic acid reduction of sulfate and the iodimetric titration of the resultant sulfide. It is suitable for a rapid control method which can be performed in two hours. Accuracy is ± 2%. E. Mann

8. GENERAL AND PHYSICAL CHEMISTRY

CO_2 as Solvent

Francis, A. W. TERNARY SYSTEMS OF LIQUID CARBON DIOXIDE. *J. Phys. Chem.*, 58, 1099-1114 (1954) December.

Mutual solubilities of liquid carbon dioxide with each of 261 other substances are reported. Nearly half of these are miscible with carbon dioxide. Some relations to structure are noted. Density observations show contractions of ten to fifteen per cent on mixing. Triangular graphs are presented for 464 ternary systems involving liquid carbon dioxide. These are of many different types, some of them novel. They include those with three separate binodal curves (and three plait points) and several with a binodal band across two sides of the triangle and a separate binodal curve on the third side. Another system has three plait points although one pair of components is miscible. Carbon dioxide has a strong homogenizing action upon pairs of other liquids at moderate concentrations, but a precipitating action at higher concentrations. In contrast to most solvents it has a selectivity against dicyclic hydrocarbons. Cosolvents were found necessary to make these unusual properties effective in solvent extraction of hydrocarbon mixtures. The large collection of unusual graphs provides experimental evidence on methods of merging of binodal curves. External contact of convex curves always occurs at both plait points.

Author's Abstract

Diamond-Graphite

Neuhaus, A. THEORETICAL PRINCIPLES OF DIAMOND SYNTHESIS. (*Angew. Chemie* 66, 532-36 (1954); *Eng. Digest* (Brit.), 15, 507-10 (1954) December.

Recent thermodynamic and experimental studies of the graphite-diamond system permit a reexamination of the equilibrium diagram and transformation curves. Graphite appears to be the stable form below pressures of 20,000 to 35,000 atm at respective temperatures of 1500° and 5000° K. Even above these pressures (in the stable formation range of diamond) the metastable formation of graphite nuclei is preferred kinetically, and seeding or inoculation with diamond would be necessary. Higher temperatures favor the reduction of the aromatic, graphitic and C_2-bonded groupings, and increase the atomic carbon migration. Supplementary substances, such as oxygen and MnS are possible aids to atomic migration effective at lower temperatures. The unusual thermodynamic difficulties explain the failure of past attempts at diamond synthesis, but these are not insuperable to present day engineering techniques.

S. Mori

Gas Conductivities

Powers, R. W., Mattox, R. W. and Johnston, H. L. THERMAL CONDUCTIVITIES OF CONDENSED GASES. I. THE THERMAL CONDUCTIVITY OF LIQUID NITROGEN BETWEEN 65 AND 90° K. II. THE THERMAL CONDUCTIVITIES OF LIQUID NORMAL AND OF LIQUID PARAHYDROGEN FROM 15 TO 27° K. III. THE THERMAL CONDUCTIVITY OF LIQUID DEUTERIUM FROM 19 TO 26° K. *J. Am. Chem. Soc.*, **76**, 5968-5974 (1954) December 5.

A conductivity cell was used which was very similar to that employed by Hamman, but with some of the fundamental weaknesses corrected. Unfortunately calibration with helium as a secondary standard was necessary to determine heat losses through the cell walls. A thick body of liquid was used and temperature differences of the order of 5° C. were employed. Eddy conduction and nonhorizontal isotherms would seem to be possible. The results for liquid N_2 agree fairly well with Borovik, Matveev and Panin, but are twenty percent lower than Hammann's. Data for N_2, H_2 and D_2 are presented.

R. T. Ellington

Nitrogen Vapor Pressure

Armstrong, G. T. VAPOR PRESSURE OF NITROGEN. *J. Res. Nat. Bur. Standards*, **53**, 263-266 (1954) October.

The vapor pressure, saturated liquid and vapor densities, and fugacity function of nitrogen in the temperature range 64° to 78°K are presented. The normal boiling point of nitrogen, calculated from the equation representing the vapor pressure data,—log P (mm) = 6.49594 — 255.821/ (T — 6.600), is 77.364°K. Saturated nitrogen vapor densities can be represented by Log ρ T = 3.39858 — 282.953/ (T — 3.83).

B. E. Eakin

Surface Roughness

Zehender, E. (assigned to Robert Bosch G.m.b.H.) METHOD OF DETERMINING SURFACE ROUGHNESS. U. S. 2,693,735 (1954) November 9.

A method of determining surface roughness by the aid of an interference microscope is presented. The practicality of other methods limited to elevations or depressions less than about one micron and the case of flutes or grooves traversing the surface, and so impeding an exact determination of the depth, seems to be overcome by increasing the wavelength of the operating light source. The invention involves generally the production of optical interference lines of equal thickness by passing at least one of the interfering light rays in an interferometer through a transparent imprint or matrix of the surface being investigated, said matrix being an exact replica of the surface to be investigated and being embedded in or arranged in intimate contact with a preferably fluid medium having a refractive index different from the refractive index of said matrix. A few diagrams and formulas are given and discussed.

S. Sensi

9. ORGANIC CHEMISTRY

Adsorption Process

Scheeline, H. W. (assigned to Standard Oil Development Co.) FRACTIONATION OF HYDROCARBON GASES BY SOLID ADSORBENTS. U. S. 2,693,865 (1954) November 9.

Easily polymerizable constituents, chiefly diolefins, are first removed from a hydrocarbon gas stream by a guard adsorbent which can be vigorously regenerated, then the gas stream is passed to a countercurrent contact with a larger body of activated carbon to fractionate C_1 to C_3 hydrocarbons. The guard adsorbent ensures longer life of the main adsorptive carbon and may be operated as a fixed or moving bed or a fluid solids system.

O. P. Brysch

Ethylene Purification

Box, E. O., Jr. (assigned to Phillips Petroleum Co.) SELECTIVE REMOVAL OF ACETYLENE FROM ETHYLENE-CONTAINING GASES. U. S. 2,693,496 (1954) November 2.

A method of selectively removing acetylene from ethylene-bearing gases is described. The acetylene is polymerized with a chromium oxide-calcium nickel phosphate catalyst without appreciable loss of ethylene.

J. M. Reid

Phthalic Anhydride

Fugate, W. O. and Tribit, S. W. (assigned to Am. Cyanamid Co.) PRODUCTION OF PHTHALIC ANHYDRIDE AND ABRASION-RESISTANT FLUID CATALYST THEREFOR. U. S. 2,698,330 (1954) December 28.

A method of vapor phase catalytic oxidation of

naphthalene to phthalic anhydride is claimed which comprises passing the air-naphthalene (1-2 mole percent) mixture through a fluidized mass of catalyst particles (40-150 micron) at 330°-370° C. The catalyst claimed contains 42% calcined silica gel impregnated with 20 to 50% K_2SO_4, 3 to 25% V_2O_5 and 0.05 to 5% of AgO or Ce_2O_3. O. P. Brysch

Polymer Degradation

Madorsky, S. L. and Straus, S. THERMAL DEGRADATION OF POLYMERS AS A FUNCTION OF MOLECULAR STRUCTURE. *J. Res. Nat. Bur. Standards*, 53, 361-70 (1954) December.

Organic polymers, when heated in a vacuum at temperatures of about 200 to 500° C., break up into molecular fragments of various sizes depending on the nature of the polymer. For instance, poly-alphamethylstyrene yields exclusively the monomer, while others like polyethylene yields a whole spectrum of molecular fragments consisting of 2 carbon atoms in the chain to about 50 or more. Polymers, intermediate in nature between the above types yield partly monomer and partly large fragments. The rate of formation and volatilization of these fragments depend upon the nature of polymers. A comparison of the rates of volatilization of a series of polymers at 350° C. has shown that polytetrafluoroethylene is the most thermally stable polymer and poly-alpha-methylstyrene is the least stable polymer. The variation in the thermal behaviour of the polymers is correlated with the molecular structure of polymer chains and with the nature and frequency of side groups. K. C. Channabassappa

Solvent from H_2S

BANKING ON SOLVENCY. *Chem. Week*, 76, 62, 64, 66 (1955) January 15.

Stepan Chemical Company is considering construction of a 10-million-lbs/year plant for production of dimethyl sulfoxide. Potential applications of this new product include use as antifreeze, paint remover, reaction medium, solvent for welding gas and synthetic fibers and selective solvent for petrochemical and fatty acid purification. The compound is made from methanol and H_2S. D. M. Mason

10. CHEMICAL ENGINEERING

Adsorption Mechanisms

Corrigan, T. E. CHEMICAL ENGINEERING FUNDAMENTALS. PART II—CATALYSIS AND ADSORPTION. *Chem. Eng.*, 61, 198, 200, 202, 04, 06, 08 (1954) December.

Equilibrium adsorption of gases on solids is illustrated for various assumed mechanisms including dissociation and association of the absorbate, leading to conventional adsorption isotherms. A numerical example is included to show the technique of evaluating adsorption constants for hydrocarbon gases.

C. G. von Fredersdorff

Bulk Solids Flow

Jenike, A. W. BETTER DESIGN FOR BULK HANDLING. *Chem. Eng.*, 61, 175-180 (1954) December.

Based on empirical methods, the author has developed a theory of bulk solids flow in bins and hoppers. With a discussion on the mechanics of solids flow and an analysis of pressures in a bin due to the weight of the material, impact and vibration, it is shown that the flow is governed by a property called the flow-factor. Experimental methods for measuring this flow-factor are given. Additional flow formulas are derived for determining hopper dimensions which will eliminate doming and the formation of a permanent cone in the bin. E. J. Pyrcioch

Computor Techniques

Medkeff, R. J. and Matthews, H. SOLVING PROCESS-CONTROL PROBLEMS BY ANALOG COMPUTER. *Instr. and Autom.*, 27, 1624-26 (1954) October.

Process-control problems are susceptible to rapid analysis by use of simulation and analog methods. The three general classifications of analog methods—mathematical, direct electrical, and abstract—are described in general terms. Some of the studies which can be handled by these techniques are: time transformations, process-control studies and process lags or delays. The method of approach to a problem and some of the questions that can be answered by an analog study, are presented. The fast-time computer can be an invaluable aid in working out starting procedures for complicated systems. B. E. Eakin

Nolan, J. E. ANALOG COMPUTERS AND THEIR APPLICATION TO HEAT TRANSFER AND FLUID FLOW—PART I. *Computers and Automation*, 3, 20-23 (1954) November.

The first in a series of articles explaining the application and operation of analog equipment for the solution of physical problems. Since analog computers are calculus type instruments they are not applicable to the handling of numbers directly, but operate by simulation of the variables of the system under study. Their greatest application is in the study of dynamic systems, where the existence of transients may prove to be very important, or in the solution of completed hydraulic networks, where the interaction of each component can disturb all the other components. The accuracy of analog computers is limited to 10^{-3} or 10^{-4}, with 10^{-5} being obtained under very special operating conditions. The MIT Differential Analyzer, for evaluating solutions to ordinary differential equations, and the Anacom and Cal. Tech. for analyzing electrical network problems, are examples of large scale special-application analog equipment. Analogs represent a fast, economical means of obtaining solutions of engineering accuracy to complex problems. B. E. Eakin

Condensers

Katz, D. L., Young, E. H. and Balekjian, G. CONDENSING VAPORS ON FINNED TUBES. *Petroleum Refiner*, 33, 175-178 (1954) November.

Low condensing coefficients give finned tubes an advantage over plain tubes. Presented here are the methods for designing shell and tube condensers with both plain and finned tubes. A comparison of experimental transfer coefficients with those predicted by the Nusselt correlation is presented, along with a sample calculation, in detail, for designing a plain and finned tube unit. B. E. Eakin

Fluidization Control

de la Pomélie, M. M. (assigned to Gaz de France) METHOD AND MEANS FOR DEFINING AND ADJUSTING THE LEVEL OF A LOAD OF SOLID MATERIAL INSIDE A NONTRANSPARENT CHAMBER. U. S. 2,696,606 (1954) December 7.

The primary feature of this invention is that the level of the load of solid material is obtained by comparing the pressures prevailing inside a gasiform fluid passing through the load inside the vessel at different levels, as measured through tappings provided both above and below the level of the load. S. Volchko

Heat Transfer

Klingenberg, A. HEAT TRANSFER IN CROSS-FLOW HEAT EXCHANGERS AND PACKED BEDS. *Ind. Eng. Chem.*, 46, 2285-89 (1954) November.

The generalized partial differential equations for heat transfer in cross-flow heat exchangers or for heat or mass transfer in packed beds have been solved by various investigators. The methods of solution are critically reviewed according to the following classification: 1) Bessel functions; 2) Finite differences; 3) Power or/and exponential series; 4) Error functions. Preferable solutions have been recommended for different ranges of the variables. S. Hu

Ion Exchange

Mindler, A. and Paulson, C. F. ION EXCHANGE: UNIT OPERATION ON THE MOVE. *Chem. Week*, 75, 43-48, 50, 52, 54, 56 (1954) December 18.

Ion exchange as a unit process is mainly applied to water conditioning, sugar refining, hydrometallurgy, industrial and fine chemical manufacture, food industry, medical and catalytical operations, and chromatography. The objectives, operational principles and procedure, materials, and economical aspects of the process as applied to various individual fields have been discussed in great detail. Points of major interest are summarized in tabular form. S. Hu

Pressure Vessels

Weiler, V. SOME CONSIDERATION OF COST IN THE DESIGN OF PRESSURE VESSELS. *Chem. Eng. Progress*, 50, 622-25 (1954) December.

This article is intended primarily as a guide to problems encountered in cost estimating pressure vessels. Basic cost indices are given for pressure tanks, nozzles and plates in a range of compositions from ordinary steel to 18-8 stainless. C. G. von Fredersdorff

Spray Tower Hold-Up

Thornton, J. D. LIMITING HOLDUP AND FLOODING RATES IN SPRAY-EXTRACTION COLUMNS. *Chem. and Ind.* (British), No. 52, 1581-82 (1954) December 25.

A proposed expression for correlating the mean relative droplet velocity in a spray tower, up to the flooding point, in terms of the physical properties of the system and the geometry of the column, with an accuracy of 20 percent. S. Hu

Steam Properties

Keyes, F. G. and Keenan, J. H. THE PRESENT STATUS OF STEAM PROPERTIES. Am. Soc. Mech. Eng. Paper No. 54-A-237, New York (1954) November; *Combustion*, 26, 34-37 (1955) January.

The existent data on steam properties, in the temperature-pressure range proposed by the Third International Steam Table Conference held in 1934, are found to be very consistent. With modern experimental technique, it is suggested that the investigation be extended to a higher temperature-pressure range of 800° C. and 1,000 atmospheres through similar international coopeation. Also the viscosity and thermal conductivity of steam should be known, with an accuracy of not less than 1%, to 800° C. at low pressures and to pressures of 200 atmospheres and temperature of 400° C. In addition to being of pure academic interest, the suggested investigations are thought to be urgently needed for practical design purposes.

S. Hu

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Borehole Camera

Burwell, E. B., Jr., and Nesbitt, R. H. BOREHOLE CAMERA IS MILESTONE IN SUBSURFACE EXPLORATION. *J. Metals*, 6, 1197-98 (1954) November.

A camera has been developed that permits photographing of the walls of a conventional 3-inch exploratory core bore-hole. The modified movie camera takes 16 frames per foot of bore, showing 1 inch of the hole on each picture. A powerful high-voltage circular flash bulb provides sufficient illumination for Kodachrome pictures of the walls of a hole filled with water. Used in a dam site investigation, the camera located and photographed a fault zone precisely, recording delicate changes in rock coloring, fractures as small as 1/100-inch, and the surface of the groundwater table. A compass, visible in each picture, permitted orientation of all these features on a unique cylindrical projection screen. The camera is designed to withstand a hydrostatic head of 500 feet of water. Seventy-five feet of hole can be photographed continuously before relocating is necessary. B. E. Eakin

Gas Instruments

Lucas, T. A. INSTRUMENTATION IN THE GAS INDUSTRY. *Gas J.* (British), 281, 43-46; *Gas World* (British), 141, 187 (1955) January 15; *Gas Times* (British), 81, 466-68, 499-500 (1954) December 24.

Some recent developments in instrumentation for gas plants are reviewed. A hot-wire anemometer which can read from 5 to 40 ft per sec. has been designed for gas distribution purposes and is finding application in measuring air flows in coke-fired brick kilns. For recording temperature difference in the standard Fairweather recording calorimeter electrical resistance thermometers are now employed, while compensation for barometric changes is obtained electrically in the calorimeter. A laboratory specific gravity balance has been adopted for spot specific gravity determinations in plants. Described are automatic process control installations for control of producer gas to coke ovens, for calorific value control and constant pressure and volume governors for distribution purposes.

E. J. Pyrcioch

Orifice Meters

Thrasher, L. W. and Binder, R. C. EFFECT OF EDGE THICKNESS ON SMALL ORIFICE METERS. *Inst. and Automation*, 27, 1810-11 (1954) November.

A report of investigations of the effect of edge thickness on orifice meter coefficients. Three sets of fine orifice plates were tested with Beta ratios of 0.2, 0.5 and 0.7. The meter run was ¾" diameter and the test fluid was water. The tests indicate that if the orifice edge thickness is less than 1/40 of the pipe diameter, edge thickness has no effect on discharge coefficient.

R. F. Bukacek

12. MATERIALS OF CONSTRUCTION

Ceramic Coatings

Pechman, A. HIGH TEMPERATURE CERAMIC COATINGS. *Ind. Finishing* (British), 7, 336-338, 340-345 (1954) December.

The methods employed in coating metals with the various ceramics, their uses and advantages are discussed in this article. S. Volchko

Coating Techniques

Radecke, F. T. TO COMBAT ATMOSPHERIC CORROSION. Petroleum Eng., 26, C18, 21, 24-26, 28-29 (1954) December.

This article outlines a project which was initiated to reduce atmospheric-corrosion costs and to improve exterior coating durability.

S. Volchko

Wright, B. C. HOT-SPRAY APPLICATION OF VINYL-BASE PAINTS. *Oil Gas J.*, 53, 145-46 (1954) December 13.

A new technique for hot-spray application, by the Carbide and Carbon Chemicals Co. in Texas City. They found by applying vinyls hot it is possible to obtain 3 mils per coat, to expand the field of spray application, and to obtain a better job—all of this with less skilled spray-painters and for a lower total cost.

S. Volchko

Copper Corrosion

Campbell, H. S. A NATURAL INHIBITOR OF PITTING CORROSION OF COPPER IN TAP-WATERS. *J. Appl Chem.*, 4, 633-647 (1954) December 4.

Many supply waters that might be expected to cause pitting corrosion in copper cold-water pipes containing carbon films do not do so because they contain a natural inhibitor. The inhibitor has not been identified, but it can be shown to be present in these waters and its concentration can be compared roughly with a standard. The inhibitor, which is considered to be of organic origin, is associated with bluish-white fluorescence in ultra-violet light, and with depression of the maximum normally present in the polarograms of waters containing dissolved oxygen. It causes cuprous oxide to be found at corroding copper anodes as a fine-grained, dull-brown adherent film instead of as coarse, red non-adherent crystals. The latter property accounts for its inhibiting effect.

Author's Abstract

Sulfide Corrosion

NACE Technical Committee Reports Publ. 54-5. SULFIDE CORROSION CRACKING OF OIL PRODUCTION EQUIPMENT. *Corrosion*, 10, 413-419 (1954) November.

Field experience with sulfide corrosion cracking of production equipment, particularly tubing and casing, in sour gas-condensate and high-pressure sour oil wells is summarized along with data from recent field tests. Preventive measures are described including selection of materials with minimum susceptibility to cracking and use of inhibitors. Laboratory and field test methods are reviewed. General status of the sulfide corrosion cracking problem as it exists is described and future problems involved in very deep sour wells are considered.

Authors' Abstract

Welding of Steels

Hall, A. M. GRAPHITIZATION IN STEEL. *Materials and Methods*, 40, 96-99 (1954) November.

Most unhardened structural and engineering steels are normally made up of two micro-structural components namely, ferrite (iron) and cementite which is iron carbide (Fe_3C). Steel of this mixture is thermodynamically unstable and given the opportunity, i. e., prolonged exposure at elevated temperatures, the cementite will decompose into its elements iron and carbon, the latter will take the form of graphite which is soft and weak. The steel will then be converted from the thermodynamically unstable mixture to the thermodynamically stable mixture of ferrite and graphite. The process of this conversion is known as graphitization. The principle type concerned in this article is localized graphitization, the most frequently enjoint since here like all other chemical reactions the graphitization process is influenced by temperature. In order to prevent graphitization at temperatures exceeding 800° F. it is advisable to abandon the plain-carbon and carbon-molybdenum steels in favor of chromium-molybdenum steels which have thus far proved to be immune to graphitization. S. Volchko

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